TITLE

MOTORCYCLE AND SMALL VEHICLE LIFT

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of the co-pending U.S. patent application serial no. 10/187,376 filed July 1, 2002.

BACKGROUND OF THE INVENTION

The present invention relates generally to an apparatus for lifting small vehicles such as motorcycles for maintenance and storage purposes.

There are many different prior art lifts designed for use with small vehicles such as motorcycles, motorbikes, snowmobiles, garden tractors, and the like. Typically, these lifts use a jack to raise a platform or arms supporting either the vehicle ground engaging portion (tires, treads, etc.) or the vehicle frame.

The U.S. Patent No. 4,088,303 shows a boom pivoted at one end on the upper end of a post and a hydraulic cylinder for raising and lowering the boom. A platform is attached to an opposite end of the boom for supporting a vehicle.

The U.S. Patent No. 4,460,158 shows a lift for mopeds and motorcycles having a base, a jack for raising and lowering a frame hinged to the base and a support attached to the frame for clamping the footboard of a Vespa brand moped.

The U.S. Patent No. 4,723,756 shows a lift with four vertically telescoping legs that can be pinned in place when a jack has raised the lift to the desired height.

The U.S. Patent No. 4,899,985 shows a low-profile hydraulic lift with a pivoted lift arm having detachable lift heads which include hooks, support yokes, chains and support harnesses.

The U.S. Patent No. 5,211,265 shows a scissors-type snowmobile lift with rails to contact the snowmobile bellypan.

The U.S. Patent No. 5,271,603 shows a lifting platform connected to a base by four parallel links actuated by a hydraulic jack.

U.S. Patent No. 6,092,787 shows a manually operated motorcycle lift with a front wheel clamp and a removable extension under the unsupported rear wheel.

SUMMARY OF THE INVENTION

The present invention concerns an apparatus for lifting a small vehicle, such as a motorcycle, for various purposes such as cleaning, maintenance, repositioning from one location to another and storage. The lift apparatus includes: a ground engaging base frame having a generally horizontally extending central beam with a generally vertically extending intermediate beam attached at each end thereof, each said intermediate beam having an upper end with a generally horizontally extending end beam attached thereto, a pair of spaced apart upwardly extending posts and a pair of generally horizontally extending legs, said legs each having an inner end adjacent one of said posts and an outer end, said leg inner ends being spaced a first predetermined distance apart and said leg outer ends being spaced a second predetermined distance apart greater than said first predetermined distance; a pair of parallelogram linkages, each said linkage having an upper link, a lower link extending generally parallel to said upper link, an outer link, and an inner link formed by a portion of an associated one of said posts, said upper link being connected by first and second pivot means to said inner and outer links respectively, said lower link being connected by third and fourth pivot means to said inner and outer links respectively; a vehicle support means attached to said outer links; and an actuator means having a lower end pivotally connected to said base frame and an upper end pivotally connected to said lower links whereby extension of said actuator means raises said vehicle support means between a lowered position for engaging and disengaging from a vehicle and a fully raised position.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light of the accompanying drawings in which:

Fig. 1 is a front elevation view of a lift apparatus in accordance with the present invention in a storage position;

Fig. 2 is rear elevation view of the lift apparatus shown in Fig. 1;

Fig. 3 is a left side elevation view of the lift apparatus shown in Fig. 1;

Fig. 4 is a right side elevation view of the lift apparatus shown in Fig. 1 in an operating position;

Fig. 5 is a fragmentary perspective view the lift apparatus shown in Fig. 1;

Fig. 6 is a block diagram of the power unit of the lift apparatus shown in Fig. 1;

Fig. 7 is a side perspective view of an alternate embodiment lift apparatus in accordance with the present invention;

Fig. 8 is an enlarged fragmentary perspective view of the upper end of the actuator and load supporting means shown in Fig. 7; and

Fig. 9 is an enlarged fragmentary perspective view of the lower end of the actuator shown in Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figs. 1 through 5, there is shown a lift apparatus **10** designed to lift motorcycles and other small vehicles for purposes such as maintenance, repositioning and storage. In Figs. 1-3, the lift apparatus **10** is shown in a folded position that is very compact for easy storage when not in use. A base frame **11** has a central beam **12** extending in a horizontal direction. Attached to opposite ends of the central beam **12** are vertically extending intermediate beams or legs **13** each having an upper end attached to an associated horizontally outwardly extending end beam or arm **14**. The beams **12**, **13** and **14** can be made from square steel tubing, for example, and welded together. A free end of each of the end beams **14** is cut at an angle and closed by an attached cap or plate **15**. A caster assembly **16** is attached to and extends downwardly from the bottom surface of the free end of each of the end beams **14**. The caster assemblies **16** can be any suitable commercially available product that typically includes a rubber wheel that rotates about vertical (swivel motion) and horizontal (rolling motion) axes with a foot operated brake lever **16a** for controlling the rolling motion.

Attached to a forward facing surface of each end of the central beam **12** is an inner end of each of an inner stub leg **17** and an outer stub leg **18**. The stub legs **17** and **18** extend horizontally forwardly and diverge being spaced farther apart at outer ends than at the inner ends attached to the central beam **12**. The outer legs **18** are shorter than the inner legs **17** and a first bracket plate **19** is attached to an outer side wall of each of the outer legs **18** adjacent the

outer end and extends even with the outer end of the inner stub leg **17**. Apertures are formed in the inner legs **17** and the first bracket plates **19** to receive a pivot means or axles **20** in the form of a bolt and nut extending horizontally transverse to a longitudinal axis of the respective outer stub leg **18**. Positioned between the inner stub leg **17** and the bracket plate **19** is an inner end **21a** of a folding leg **21** having apertures formed therein receiving the axle **20** thereby permitting the legs to be rotated between a down or operative position (Figs. 4-5) and an up or storage position (Figs. 1-3). The legs **17**, **18** and **21** can be made from square steel tubing, for example, with the legs **17** and **18** welded to the central beam and the intermediate beams **13**.

A stop **22**, in the form of a short length of square tubing, is attached to an upper surface of the outer end of the outer stub leg **18** and extends beyond that outer end. A pair of second bracket plates **23** are attached to opposite side walls of the stop **22** and extend outwardly beyond the outer end of the stop. When the folding leg **21** is rotated about the axle **20** to the up position (Figs. 1-3), the stop **22** prevents rotation beyond a generally vertical position. A fastener **24** can be inserted through apertures formed in the bracket plates **23** on the opposite side of the leg **21** from the stop **22** to prevent rotation of the folding leg from the up position back to the down position. In the down position of the folding leg **21** (Fig. 5), the fastener **24** can be inserted through vertically aligned apertures formed in the stop **22** and the leg **21** to retain the folding leg in the down position. A roller assembly **25** is attached to an outer end **21b** of the folding leg **21** at an angle to a longitudinal axis of the folding leg to compensate for the diverging angle of the folding legs. Thus, the roller assemblies **25** are aligned with the caster assemblies **16** during forward and rearward movement of the lift apparatus **10**.

A support platform **26** is attached to and extends generally horizontally forward from the central beam **12**. A lower end of a center post **27** is attached to an upper surface of the platform **26** and the post extends upwardly and rearwardly to an upper end to which a transversely extending handle **28** is attached. A pair of support members **29** are connected between the center post **29** and the end beams **14**. The handle **28** can be grasped by human hands for rolling the lift apparatus **10** on the caster assemblies **16** and roller assemblies **25** when the folding legs **21** are in the down position. When the folding legs **21** are in the up position, the handle **28** can be used to tilt the lift apparatus **10** rearwardly enough to lift the folding leg ends **21a** off of the ground and permit movement on the caster assemblies **16**.

A portion of the center post **27** functions as an inner short link of a parallelogram linkage having an outer short link **30**, a pair of upper long links **31** and a pair of lower long links **32**. The links **30**, **31** and **32** can be formed of square tubing. An inner end of each of the upper long links **31** is coupled on opposite sides of the center post **27** at a pivot means **33a** adjacent the handle **28**. An outer end of each of the upper long links **31** is coupled on opposite sides of the outer short link **30** at a pivot means **33b** adjacent an upper end of the short link. An inner end of each of the lower long links **32** is coupled on opposite sides of the center post **27** at a pivot means **33c** spaced below the pivot means **33a**. An outer end of each of the lower long links **32** is coupled on opposite sides of the outer short link **30** at a pivot means **33d** adjacent a lower end of the short link. The distance between the pivot means **33a** and **33b** is the same as the distance between the pivot means **33c** and **33d**, and the distance between the pivot means **33a** and **33c** is the same as the distance between the pivot means **33b** and **33d**. The pivot means **33a** through **33d** can be suitable fasteners such as bolts and nuts.

Attached to the lower end of the outer short link **30** is a transverse bar **34** extending generally parallel to the central beam **12**. Attached to and extending horizontally forward from opposite ends of the bar **34** are support bars or arms **35** upon which a motorcycle or small vehicle (not shown) can be supported. The bar **34** and the arms **35** can be formed of square tubing. A strip of padding **35a**, such as a neoprene material, can be attached to the upper surface of each of the arms **35**. The support arms **35** can be provided with vehicle attachment means **36** such as a plurality of sliding brackets **36a** each having an associated hook **36b** for cooperation with straps (not shown) that can be routed over and/or through the vehicle to prevent tipping. When the lift apparatus **10** is not in use, the pivot means **33d** can be removed permitting the outer short link **30** to rotate about the pivot means **33b** approximately 180° to a storage position a shown in Figs. 1-3.

Attached to each of the lower long links **32** adjacent to the pivot means **33c** is a locking plate **37** having a plurality of apertures **38** formed therein. As the lower long link **32** is rotated upwardly about the pivot means **33c**, each of the apertures **38** in turn clears a front surface of the center post **27**. A pin **39** can be inserted through the corresponding ones of the apertures **38** in the plates **37** to engage the central post **27** and prevent downward rotation of the link **32** with a resultant lowering of the support arms **35**. Thus, the apertures **38** define fixed positions of

the support arms **35** above the surface on which the lift apparatus **10** is resting. The pin **39** can be retained by a chain **40** attached to any suitable portion of the lift apparatus **10** such as the center post **27**.

An actuator **41**, such as a hydraulic piston and cylinder, can be used to raise and lower the support arms **35**. A bottom end of a cylinder **41a** is attached to the support platform **26** by a pivot means **42** for movement about an axis parallel to the rotation axes of the pivot means **33a** through **33d**. The actuator **41** extends between the lower long links **32** and has a piston rod **41b** extending from the cylinder **41a** with an upper end connected to the upper long links **31** at a pivot means **33e**. Thus, extending the rod **41b** from the cylinder **41a** raises the support arms **35** and retracting the rod into the cylinder lowers the support arms. The actuator **41** can be manually operated through a pumping handle **43** extending therefrom whereby repeated raising and lowering of the handle forces hydraulic fluid into a cylinder chamber (not shown) against a piston (not shown) to extend the piston rod **41b**. A release lever **44** is provided to vent the hydraulic fluid from the cylinder chamber thereby allowing the piston rod **41b** to retract into the cylinder **41a** under the weight of the supported portions of the lift apparatus **10**.

The actuator **41** also can be automatically operated utilizing a power unit **45** (shown schematically in Fig. 6) including an electric motor **46** driving a hydraulic pump **47**. The electric motor **46** can be an ac motor or a dc motor and is connected to a power source **48** through a start switch **49**. In the case of an ac motor, the power source typically would be a building electrical circuit accessed at a wall outlet. In the case of a dc motor, the power source **48** could be a storage battery **50** mounted at the rear of the central beam **12**. The power source **48** could include a converter (not shown) for changing ac power to dc power to operate the dc motor and/or charge the storage battery **50**. The motor **46** and the pump **47** are mounted on an adapter **51** with the pump being enclosed in a reservoir **52** mounted on an opposite side of the adapter from the pump. The adapter **51** can be attached to one of the intermediate beams **13** and extend behind the base frame **11**.

A control **53** is connected to the adapter **51** and to the start switch **49** for starting and stopping the motor **46**. To start the motor **46**, the control **53** is actuated to cause the start switch **49** to connect the motor to the power source **48**. The motor **46** drives the pump **47** to draw hydraulic fluid from the reservoir **52** and send pressured hydraulic fluid to the adapter **51**.

The adapter **51** is connected to the actuator **41** to supply the pressured hydraulic fluid causing the actuator to raise the support arms **35**. The control **53** can be actuated to stop the motor **46** and retain the actuator **41** in a desired extended position. To lower the support arms **35**, the control **53** is actuated to release hydraulic fluid from the actuator **41** to flow through the adapter and back to the reservoir **52**.

The manually actuated version of the actuator **41** can be, for example, a commercially available long ram jack such as an eight-ton capacity hydraulic long hand jack with clevis item #14554 available from Northern Tool division of Northern Tool & Equipment Co. at "northerntool.com". An alternative is the eight-ton capacity long ram jack with flat base item #14446 available from Northern Tool. The automatically actuated version of the actuator **41** can be a welded tee hydraulic cylinder item #908320 available from Northern Tool. The associated power unit 45 can include a Haldex Barnes Hydraulics 12 volt DC power unit item #1071 or a Haldex Barnes Hydraulics 1 HP 115/208-230 Volt AC Hydraulic Power Unit item #105881, both available from Northern Tool.

There is shown in Figs. 7 through 9 an alternate embodiment lift apparatus **60** designed to lift motorcycles and other small vehicles for purposes such as maintenance, repositioning and storage. In the side view position shown in Fig. 7, the lift apparatus 60 has a forward or front load engaging portion to the right and a rearward or back operating portion to the left. A base frame **61** of the lift apparatus **60** has a supporting central beam **62** extending in a horizontal direction. Attached to opposite ends of the central beam **62** are a pair of horizontally forwardly extending legs **63** each having an inner end **63a** attached to an associated end of the central beam **62** as best shown in Fig. 9. The legs **63** diverge as they extend from the central beam **62** so that outer free ends **63b** are spaced farther apart than are the inner ends **63a**. The central beam **62** and the legs **63** can be made from square steel tubing, for example, and welded together. A caster assembly **64** is connected to and extends downwardly from the base frame adjacent each inner end **63a** of each of the legs **63** and a roller assembly **65** is attached to each of the outer ends **63b** of the legs **63** to engage a surface and permit movement of the lift apparatus **60** on the surface. The caster assemblies **64** can be any suitable commercially available product that typically includes a rubber wheel that rotates about vertical (swivel motion) and horizontal (rolling motion) axes.

Extending upwardly from each inner end **63a** is an attached intermediate beam **66** having an upper end attached to an inner end of a horizontally extending end beam **67**. The beams **62**, **66** and **67** extend in a generally vertical plane and the caster assemblies **64** are attached to and extend downwardly from associated outer ends of the beams **67**. A vertically extending support member **68** is attached to and extends upwardly from each end of the central beam **62**. A diagonal support member **69** is attached at one end to an upper end of an associated one of the support beams **68** and extends downwardly and forwardly to attach at an opposite end to the associated leg **63** between the ends thereof. Fastened to each of the support members **68** is a post **70** that extends upwardly and rearwardly. Each post **70** has a handle **71** attached at an upper end and the handles **71** extend in opposite directions generally paraliel to the end beams **67**.

An upper portion of each post **70** functions as an inner short link of a pair of parallelogram linkages each having an outer short link **72**, an upper long link **73** and a lower long link **74**. The posts 70 and the links **72**, **73** and **74** can be formed of square tubing. An inner end of each of the upper long links **73** is pivotally coupled to the associated post **70** at a pivot means **75a** (such as an axle) generally axially aligned with the handles **71**. An outer end of each of the upper long links **73** is pivotally coupled to outer short links **72** at a pivot means **75b** (such as an axle) adjacent an upper end of the short links. An inner end of each of the lower long links **74** is pivotally coupled to the associated post **70** at a pivot means **75c** (such as an axle) spaced below the pivot means **75a**. An outer end of each of the lower long links **74** is pivotally coupled to the outer short links **72** at a pivot means **75d** (such as an axle) adjacent a lower end of the short links. The distance between the pivot means **75a** and **75b** is the same as the distance between the pivot means **75c** and **75d**, and the distance between the pivot means **75a** and **75c** is the same as the distance between the pivot means **75b** and **75d**.

Attached to the lower end of each of the outer short links **72** is a generally horizontally forwardly extending support bar or arm **76** upon which a motorcycle or small vehicle (not shown) can be supported. The arms **76** can be formed of square tubing. A strip of padding **77**, such as a neoprene material, can be attached to the upper surface of each of the arms **76**. The support arms **76** can be provided with vehicle attachment means **36** shown in Fig. 4 or any other suitable means.

An actuator assembly **78**, including an actuator **79** such as a hydraulic piston and cylinder, can be used to raise and lower the support arms **76**. The assembly **78** includes a base plate **80** attached to a bottom end of the actuator **79**. Attached to a bottom surface of the plate **80** is a downwardly opening generally U-shaped bracket **81** that receives a length of rod **82** attached to an upper surface of the central beam **62**. The bracket **81**, and thus the actuator **79**, are free to pivot about an axis generally parallel to the axes of the pivot means **75a** through **75d**. An upper end of the actuator **79** is pivotally attached to a connector beam **83** extending between and attached to the lower long links **74** forward of the pivot means **75c**. Thus, as the actuator **79** is extended, the links **72** and **74** are rotated upwardly at the pivot means **75a** and **75c** respectively to raise the support arms **76**. Retracting the actuator **79** lowers the support arms **76**. The actuator **79** can be manually operated through a pumping handle **84** (which can be a foot operated lever) extending from the actuator whereby repeated raising and lowering of the handle forces hydraulic fluid into a cylinder chamber (not shown) against a piston (not shown) to extend the piston rod. A release lever is provided to vent the hydraulic fluid from the cylinder chamber thereby allowing the piston rod to retract into the cylinder under the weight of the supported portions of the lift apparatus **60** and any load supported thereby.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.